February 2001

# SUMMARY OF THE SKOOKUMCHUCK CREEK BULL TROUT ENUMERATION PROJECT (2000)

Annual Report 2000

DOE/BP-28027-2

This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views of this report are the author's and do not necessarily represent the views of BPA.

This document should be cited as follows:

*Baxter, James, Jeremy Baxter, Summary of the Skookumchuck Creek Bull Trout Enumeration Project (2000) Annual Report 2000, Report to Bonneville Power Administration, Contract No. 2000BI28027 Project No. 200000400, 38 electronic pages* (BPA Report DOE/BP-28027-2)

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# Summary of the Skookumchuck Creek Bull Trout Enumeration Project (2000)

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**Report Funded By:**

Bonneville Power Administration
"Monitor and Protect Bull Trout for Koocanusa Reservoir"
BPA Project Number 2000-004-00

February 2001

## ABSTRACT

An enumeration fence and traps were installed on Skookumchuck Creek from September 7th to October 16th to enable the capture of post-spawning bull trout emigrating out of the watershed. During the study period, a total of 252 bull trout were sampled through the enumeration fence. Length, weight, and sex were determined for all but one of the 252 bull trout captured. In total, one fish of undetermined sex, 63 males and 188 females were processed through the fence. A total of 67 bull trout were observed on a snorkel survey prior to the fence being removed on October 16th. Coupled with the fence count, the total bull trout count during this project was 319 fish. Several other species of fish were captured at the enumeration fence including westslope cutthroat trout, Rocky Mountain whitefish, kokanee, sucker, and Eastern brook trout.

Redds were observed during ground surveys in three different locations (river km 27.5-28.5, km 29-30, and km 24-25). The largest concentration of redds were noted in the upper two sections which have served as the index sections over the past four years. A total of 197 bull trout redds were enumerated on the ground on October 4th. The majority of redds (n=189) were observed in the 3.0 km index section (river km 27.5-30.5) that has been surveyed over the past four years. The additional 8 redds were observed in a 1.5 km section (river km 24.0-25.5).

Summary plots of water temperature for Bradford Creek, Sandown Creek, Skookumchuck Creek at km 39.5, and Skookumchuck Creek at the fence site suggested that water temperatures were within the range preferred by bull trout for spawning, egg incubation, and rearing.

## ACKNOWLEDGEMENTS

Bill Westover (Ministry of Environment, Lands and Parks; Cranbrook) was responsible for arranging the funding for this project, and conducting all aspects of the study. His help is greatly appreciated. Lara Neilson worked long hours to monitor the fence and tag fish, and Gerry Nellestijn helped with setting up the fence. We also appreciate the help from the Ministry of Environment, Lands and Parks staff (John Bell, Herb Tepper, Ted Antifeau) and the Ministry of Fisheries staff (Laird Siemens) who helped with initial setup, dismantling the fence, and conducting redd surveys. Albert Chirico (Ministry of Environment, Lands and Parks; Nelson) produced the maps. Thanks also to TEMBEC for allowing the enumeration fence to be setup on the property of the Skookumchuck Pulp Mill.

Funding was provided by the Bonneville Power Administration under the umbrella project "Monitor and Protect Bull Trout for Koocanusa Reservoir" BPA Project Number 2000-004-00.

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# INTRODUCTION

Bull trout (*Salvelinus confluentus*) populations have declined in many areas throughout their range, particularly within Montana and throughout the Pacific Northwest including British Columbia. In 1994 bull trout were blue listed in British Columbia as vulnerable by the B.C. Conservation Data Center and although there are many healthy populations of bull trout in the East Kootenays, they remain a species of special concern. Bull trout in the American portion of the Columbia River were listed as threatened in 1998 by the U.S. Fish and Wildlife Service under the Endangered Species Act.

The upper Kootenay River is within the Kootenai sub-basin of the Mountain Columbia Province, one of the eleven Ecoprovinces that make up the Columbia River Basin. BC Environment (BCE) applied for and received funding from Bonneville Power Administration (BPA) to assess and monitor the status of wild, native stocks of bull trout in tributaries to Lake Koocanusa and the upper Kootenay River. This task is one of many that was initiated under the BPA Project "Monitor and Protect Bull Trout for Koocanusa Reservoir" BPA Project Number 2000-04-00. To effectively manage and protect bull trout population(s) of the Kootenay River and/or Lake Koocanusa, BCE has initiated several studies on bull trout in the East Kootenay region. These include enumeration projects on the Wigwam River from 1996 to 1999 (Baxter and Westover 2000), and a large scale radio telemetry project that is currently in progress.

Skookumchuck Creek is a tributary to the upper Kootenay River (Figure 1) and is thought to be an important spawning stream for bull trout from the Kootenay River and/or Lake Koocanusa. Redd counts conducted on a 3 km section of Skookumchuck Creek have documented an increase in the number of bull trout redds from 66 in 1997 to 161 in 1999. However, there is limited data on the relative abundance and biological characteristics of the bull trout population that uses the system for spawning.

To better understand the bull trout population of Skookumchuck Creek, BCE, in cooperation with BPA, initiated a project in the fall of 2000 to operate an enumeration fence and identify spawning areas. Specifically the project objectives were to:

1. capture and tag post spawning bull trout at an enumeration fence in order to estimate run size and be able to determine subsequent recaptures;
2. capture other fish species at the enumeration fence;
3. collect biological data from all sampled fish;
4. conduct redd counts to identify bull trout spawning areas in the watershed; and
5. install thermographs and monitor water temperatures at six locations in the Skookumchuck Creek drainage.

## STUDY AREA

A description of the study area has been previously reported (Cope and Oliver 1997), and this summary is adapted from this previous work. Skookumchuck Creek originates in the Purcell Mountains and the watershed is within a large portion of the Purcell Wilderness Conservancy (Figure 2). The system flows in a general northeasterly direction for 42 km into the upper Kootenay River draining an area of approximately 64,236 ha. Skookumchuck Creek has three major tributaries (Buhl Creek, Bradford Creek, Sandown Creek) that contribute a significant amount of flow to the mainstem. Mean annual discharge (1949-1976) was 11.3 $m^3 \cdot sec^{-1}$ with mean monthly minimum and maximum values of 2.0 and 49.0 $m^3 \cdot sec^{-1}$ respectively (Anonymous 1977). There is a waterfall barrier a river km 32.

Fisheries resources of the Skookumchuck Creek watershed are well documented, and include bull trout, westslope cutthroat trout (*Oncorhynchuc clarki lewisi*), Eastern brook trout (*Salvelinus fontinalis*), Rocky Mountain whitefish (*Prosopium williamsoni*), and rainbow trout (*O. mykiss*) (Cope and Oliver 1997). The Skookumchuck Creek watershed was also sampled as part of a broad scale bull trout metapopulation genetics study, and bull trout were confirmed in the mainstem of Skookumchuck Creek, Bradford Creek, and Sandown Creek (Baxter and Oliver 1997).

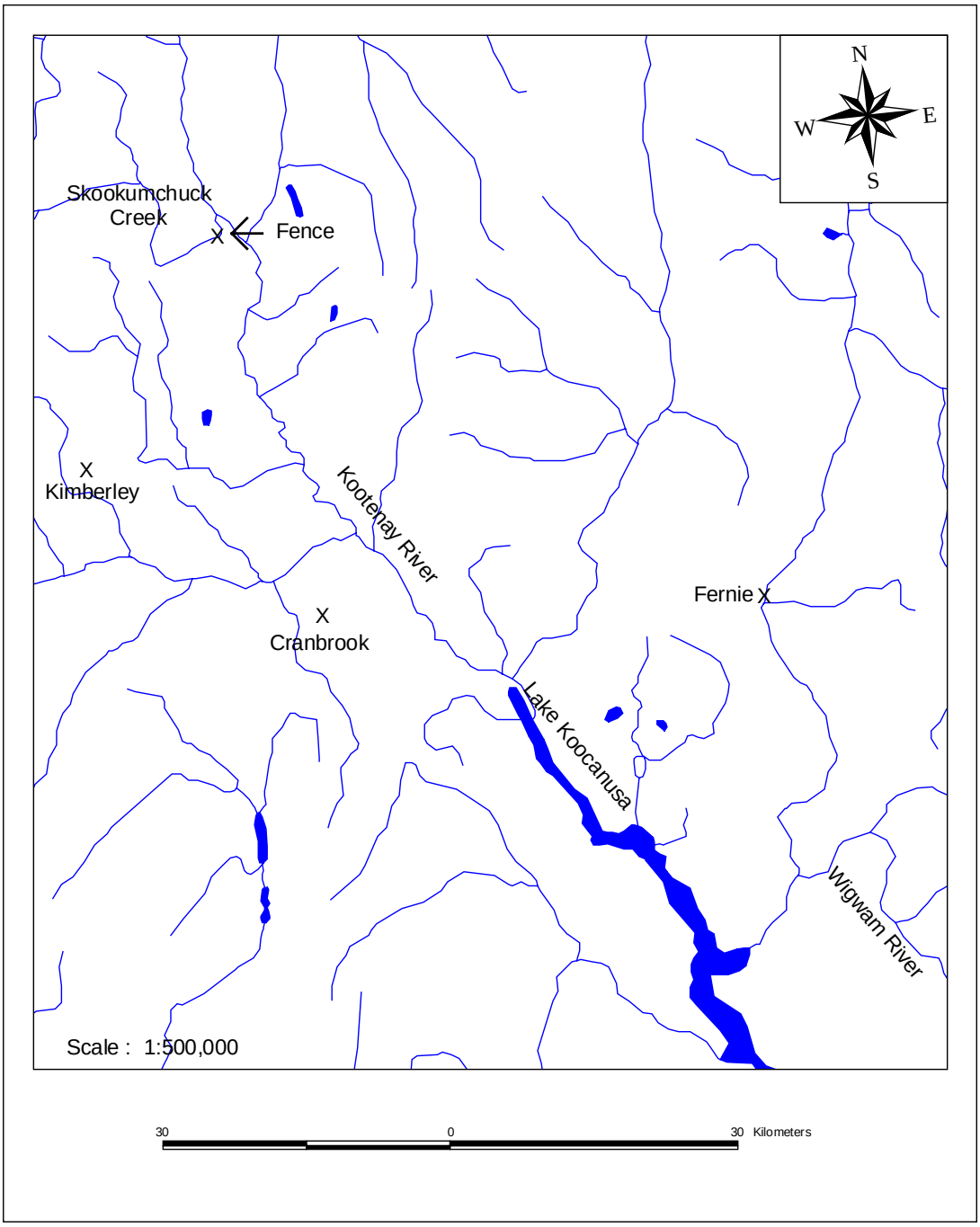


**Figure 1. Fence and trap location on Skookumchuck Creek.**

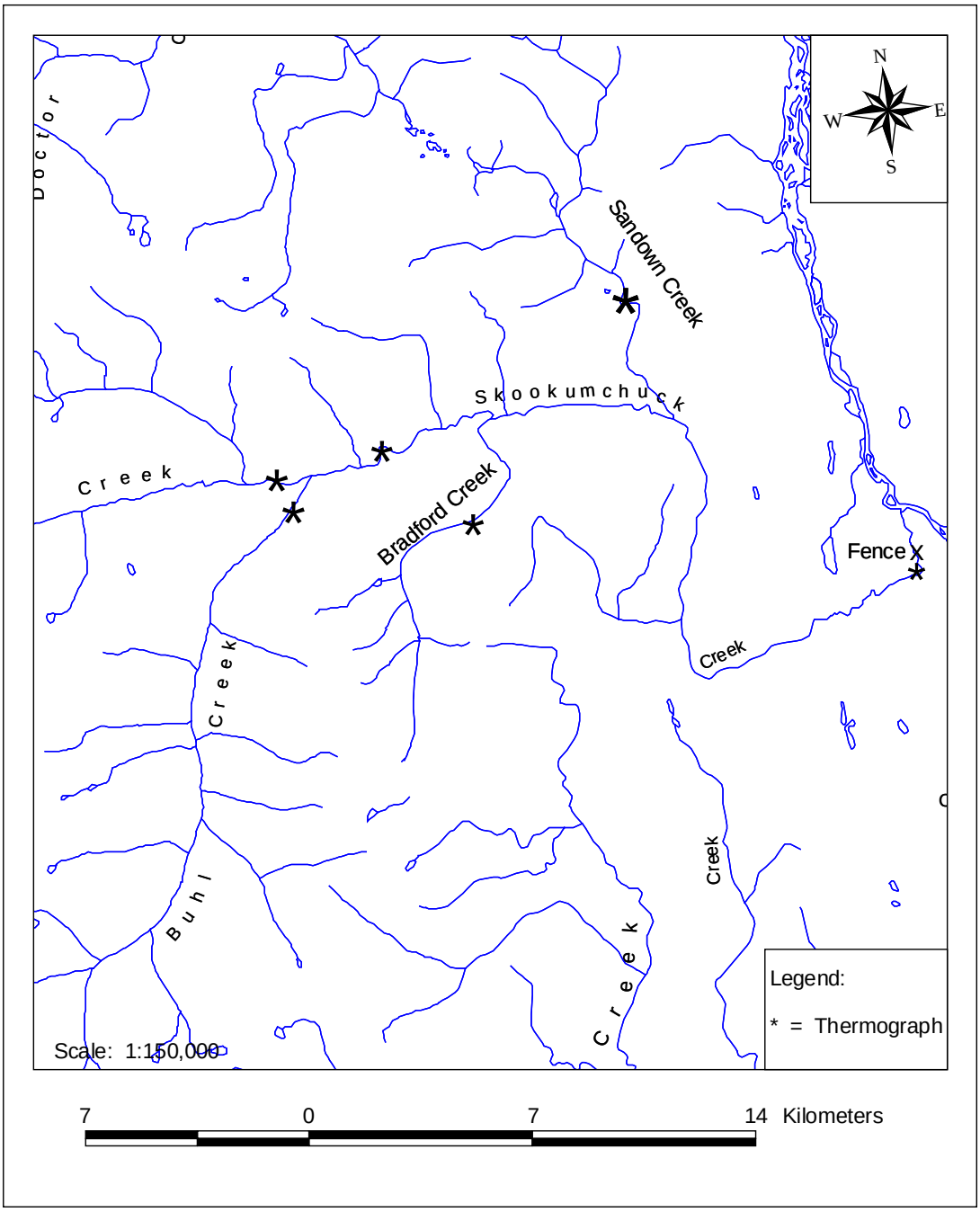


**Figure 2. Map of the Skookumchuck Creek watershed.**

## METHODS

### Trapping

A 5.0 cm square coated wire mesh fish enumeration fence supported by T-bars was installed across Skookumchuck Creek on September 7th, approximately one km upstream of the Skookumchuck Creek/Kootenay River confluence (Figure 1). The fence was set up during this time of the year in order to primarily capture downstream migrating bull trout kelts and to minimize the effect the fence might have on the reproductive biology of the fish. Upstream and downstream traps constructed of 2.5 cm wire mesh were used in conjunction with the fence to capture and hold bull trout prior to processing (Figure 3). Moveable 2.5 cm mesh wire panels were then hinged to the upstream side of the fence in order to allow debris to be removed.

Each trap was checked a minimum of twice daily by a two person crew from September 7th to when the fence was removed on October 16th. Morning checks occurred between 0600 and 0800 hours and evening checks between 2000 and 2400 hours.

**Figure 3. Skookumchuck Creek bull trout enumeration fence.**

**Enumeration, Measurement, and Tagging**

All captured fish were anaesthetized using clove at a concentration of 100 PPM (2 mL in 20 L) in a 100 L cooler. Fish were examined for the presence of previous tags and spawning condition. The fish were then subsequently measured for weight (g) and fork length (cm), sexed, and finally tagged with a Floy tag placed at the base of the dorsal fin. Floy tags used for this study were Floy FD-94 T-Bar anchor tags, with 1 inch bare monofilament below the tubing, and were inserted with a Mark II super heavy duty tagging gun having a one inch insertion using Mark II long, regular needles (outside diameter = 0.22 cm). Three fish were also radio tagged at the fence as part of the broad scale study of bull trout migration patterns in the Kootenay River (see Baxter and Nellestijn 2000 for methodology of surgery).

A total of 41 fish were also sampled for aging and genetic analysis. Sampling for these two components of the study involved removing the first three fin rays (as close to the body as possible) from the leading edge of the pelvic fin. The sampled fin rays were then cut in half. The distal half (portion farthest from the body) was placed in a vial containing 95% ethanol for DNA analysis, and the proximal half was patted dry and placed in a scale envelope for aging analysis. The vial and the envelope were then labeled to correspond to the sampled fish. Samples were sent to North/South Consultants Inc. of Winnipeg Manitoba for aging analysis, and to the B.C. Ministry of Fisheries (Victoria) for genetic analysis.

Prior to the fence being removed, Skookumchuck Creek (from the Torrent Road bridge crossing to the fence site) was surveyed by snorkeling to determine the number of bull trout upstream of the fence.

**Other Species**

Other fish that were sampled at the enumeration fence were also anaesthetized and then identified to species, enumerated, sexed (where possible), and measured for fork length (cm). After recovery the fish were released in the direction they were migrating.

**Redd Counts**

The mainstem of Skookumchuck Creek between the Kootenay River and the waterfall barrier, and Buhl Creek, Bradford Creek and Sandown Creek were flown three times in September (September 8$^{th}$, 15$^{th}$, and 22$^{nd}$) with a Bell 206 helicopter as part of the bull trout radio telemetry project. Observers were looking for bull trout redds as part of these flights.

On October 4$^{th}$, bull trout redds were enumerated by two 3-person crews that surveyed the mainstem of Skookumchuck Creek. One crew surveyed a 3.0 km section of the stream

from river km 27.5 to 30.5. This same section has been surveyed in each of the last 4 years. The other crew surveyed a 1.5 km section of Skookumchuck Creek from river km 24.0 to 25.5. This is the first year that this section of stream has been sampled. A 1.0 km section of Sandown Creek was also surveyed immediately downstream of the bridge crossing on the Skookumchuck Creek Forest Service Road.

**Water Temperature Monitoring**

A water temperature monitoring program was established as part of this project. As such, six Optic StowAway™ Temp thermographs were deployed throughout the Skookumchuck watershed. On August 10th, thermographs were deployed in the mainstem of Skookumchuck Creek at three locations (fence site, upper Skookumchuck Creek above Buhl Creek, and at km 39.5 on the Skookumchuck Creek Forest Service Road) and in Buhl Creek and Bradford Creek (Figure 2). Another thermograph was deployed in Sandown Creek on September 8th (Figure 2). The thermographs were downloaded on November 23rd in order to retrieve data prior to freeze up.

## RESULTS

### Trapping

The fence was set up and fishing after approximately 2 hours of installation time on September 7th. Site conditions experienced during the study period were generally favorable, although the fence was breached for 4 hours on the afternoon of October 4th. The fence breach was caused by a high wind event after a cold weather pattern. This wind deposited a large amount of leaves onto the fence and caused a water backup and increase in water pressure. Based on the low number of bull trout migrating during daylight hours, and the limited catch of bull trout in the period bracketing the fence breach, it is believed that no fish migrated through the fence during the short period it was inoperable.

### Enumeration, Measurement, and Tagging

During the study period, a total of 252 bull trout were sampled through the enumeration fence (Appendix I). Of the 252 fish sampled, 4 fish had both Floy and radio tags present from previous sampling (see Appendix I). Of the remaining fish, 243 were tagged with a Floy tag, three were tagged with both a Floy and radio tag and two were found dead on the fence. (Appendix I). One fish sampled at the fence appeared to have a spinal deformity (Figure 4).

**Figure 4. Bull trout sampled in Skookumchuck Creek with spinal deformity.**

Of the 252 fish that were passed through the fence, three (1.2%) were caught for the first time migrating upstream, while 249 (98.8%) were caught for the first time heading downstream. (Figure 5).

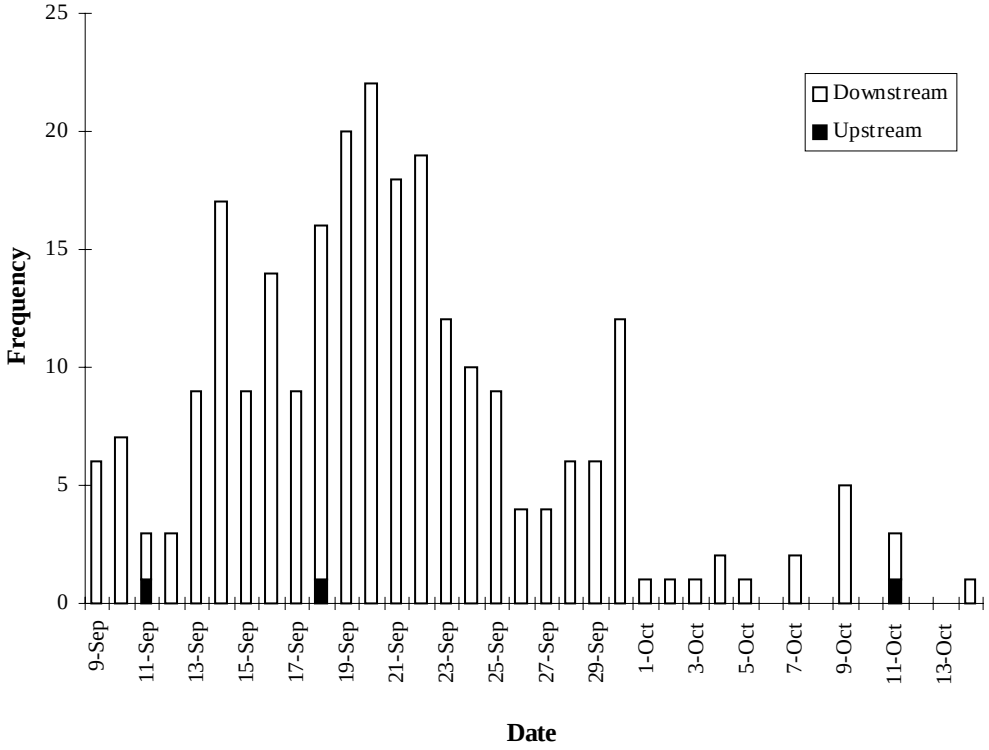


**Figure 5. Frequency and timing of bull trout migration through Skookumchuck Creek enumeration fence between September 7th and October 16th. The total number of fish captured was 252 individuals.**

Length, weight, and sex were determined for all but one of the 252 bull trout captured. In total, one fish of undetermined sex, 63 males and 188 females were processed through the fence. The average length and weight of males, females, and both sexes combined are presented in Table 1. Length frequency distributions of male and female bull trout are found in Figure 6.

**Table 1. Range, mean fork length, and mean weight of bull trout captured at the Skookumchuck Creek enumeration fence between September 7th and October 16th.**

| | | Fork Length (cm) | | Weight (g) | |
|---|---|---|---|---|---|
| | n | Range | Mean | Range | Mean |
| Males | 63 | 51-92 | 78.9 | 1000-8800 | 4894 |
| Females | 188 | 40-86 | 66.3 | 650-6100 | 2820 |
| Combined | 252 | 40-92 | 69.4 | 650-8800 | 3330 |

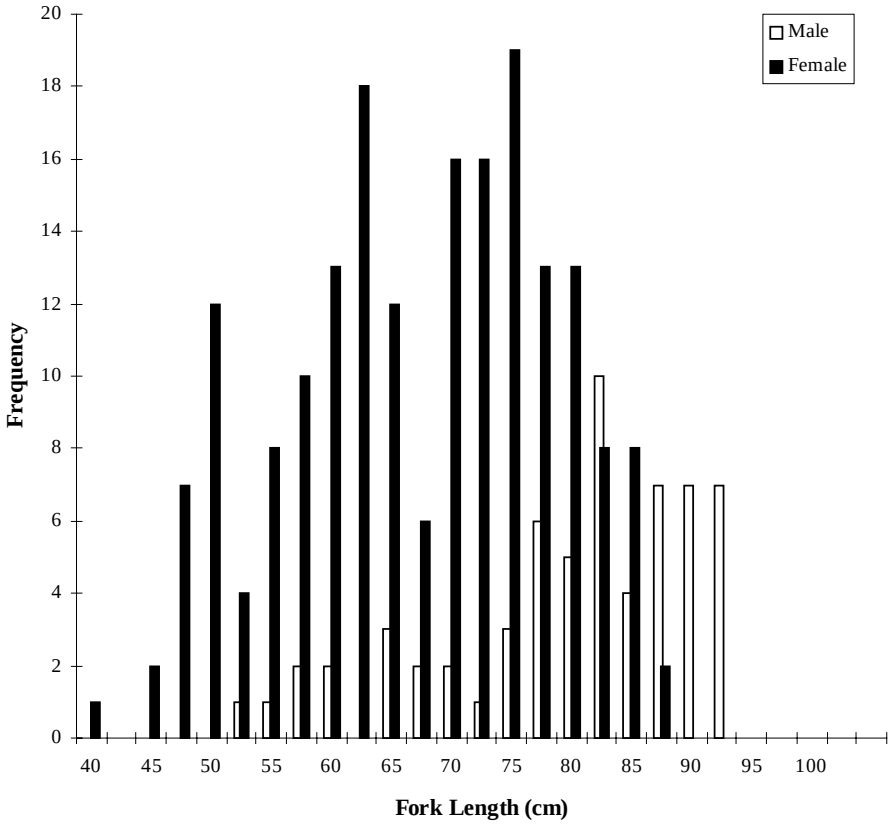


**Figure 6. Length frequency distribution of bull trout captured at the Skookumchuck Creek enumeration fence in 2000.**

Pelvic fin rays were collected from 41 fish (23 males, 17 females, one undetermined sex) sampled at the enumeration fence and these structures were aged by North/South Consultants Inc. of Winnipeg Manitoba. A summary of the mean length at age is presented in Table 2.

**Table 2. Range and mean of lengths (cm) at age for bull trout sampled in Skookumchuck Creek for aging and genetics in 2000.**

| Age | n | Range in Length (cm) | Mean Length (cm) |
|---|---|---|---|
| 5 | 2 | 43.0-54.5 | 48.8 |
| 6 | 1 | 56.0 | 56.0 |
| 7 | 6 | 45.0-80.0 | 62.4 |
| 8 | 5 | 62.0-76.5 | 66.6 |
| 9 | 7 | 72.0-90.0 | 79.2 |
| 10 | 7 | 68.5-89.0 | 80.1 |
| 11 | 2 | 67.0-87.5 | 77.3 |
| 12 | 3 | 77.0-91.5 | 83.2 |
| 13 | 2 | 78.0-83.0 | 80.0 |
| 14 | 2 | 72.0-91.5 | 81.8 |

Plots of age versus length for females (Figure 7) and males (Figure 8) suggested that age could be predicted by length for both sexes, although there was much more variability in age at length for males. For females, age can be predicted from length by the equation: Age = 0.22 X Fork Length (in cm) – 5.5; $r^2$=0.74. For males, age can be predicted from length by the equation: Age = 0.12 X Fork Length (in cm) + 0.16; $r^2$=0.28.

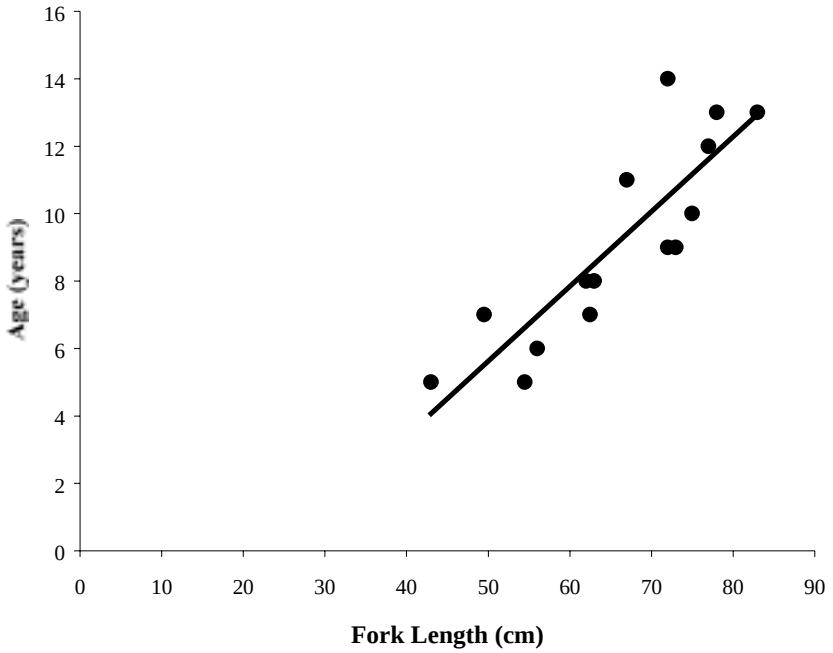


**Figure 7. Length at age relationship of female bull trout sampled at the Skookumchuck Creek enumeration fence in 2000.**

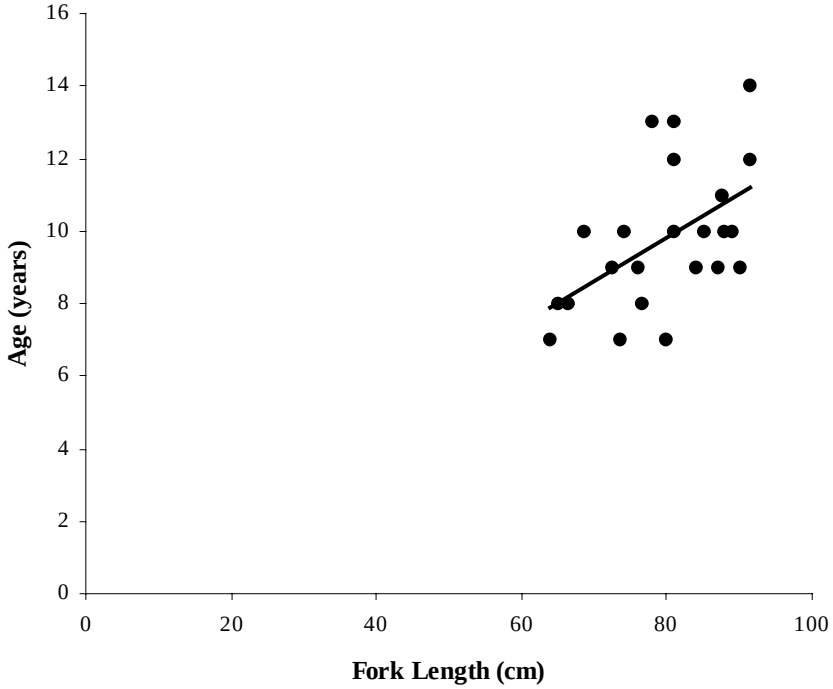


**Figure 8. Length at age relationship of male bull trout sampled at the Skookumchuck Creek enumeration fence in 2000.**

A total of 67 bull trout were observed on the snorkel survey prior to the fence being removed on October 16th. Two bull trout observed had spinal deformities similar to the fish in Figure 3. Coupled with the fence count, the total bull trout count during this project was 319 fish. Of the 251 sexed fish a total of 188 were females and 63 were males. This would place the sex ratio at 3.0:1 females to males. However, this ratio should be interpreted with caution as female bull trout are known to out migrate from spawning systems more quickly than males, and there were a significant number of bull trout still upstream of the fence when it was removed.

**Other Species**

Several other species of fish were captured at the enumeration fence including westslope cutthroat trout, Rocky Mountain whitefish, kokanee (*O. nerka*), sucker (*Catostomus* spp.), and Eastern brook trout.

In total three westlope cutthroat trout were captured migrating downstream. These fish were measured for fork length and weight, and were Floy tagged and released (mean length = 39.3 cm, mean weight = 733.3 g). Large numbers of Rocky Mountain whitefish (n=960) were sampled at the fence, with the majority of the fish migrating downstream (mean length = 25.4 cm; Figure 9).

The fence was also set up during the spawning period of kokanee and, although the majority of the fish were able to pass through the fence due to their small size, a large number of fish were sampled. In total 52 kokanee were sampled at the fence, of which 30 were females and 22 were males. Females averaged 25.4 cm in fork length (Figure 10), and males averaged 25.6 cm in fork length (Figure 11).

A total of 18 sucker were captured in the enumeration fence, and all were migrating downstream. The fish averaged 45.4 cm in fork length (Figure 12). One Eastern brook trout was also captured in the enumeration fence. It was a male caught migrating upstream, and was 31.5 cm in fork length and 300 g in weight.

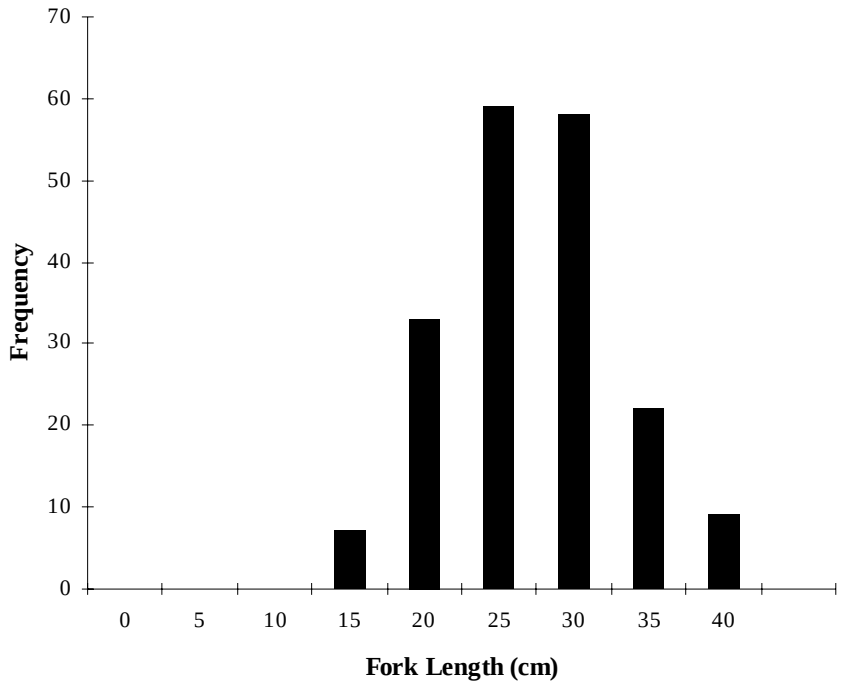


**Figure 9. Length frequency distribution of Rocky Mountain whitefish sampled at the Skookumchuck Creek enumeration fence in 2000.**

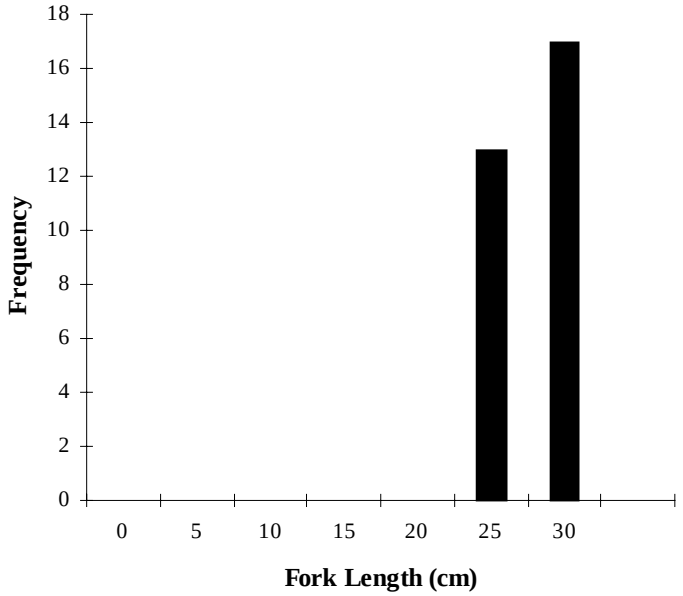


**Figure 10. Length frequency distribution of female kokanee sampled at the Skookumchuck Creek enumeration fence in 2000.**

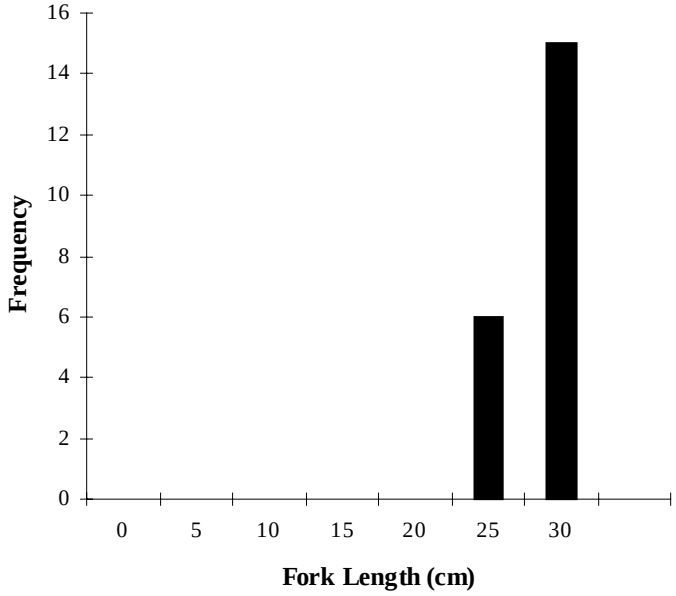


**Figure 11. Length frequency distribution of male kokanee sampled at the Skookumchuck Creek enumeration fence in 2000.**

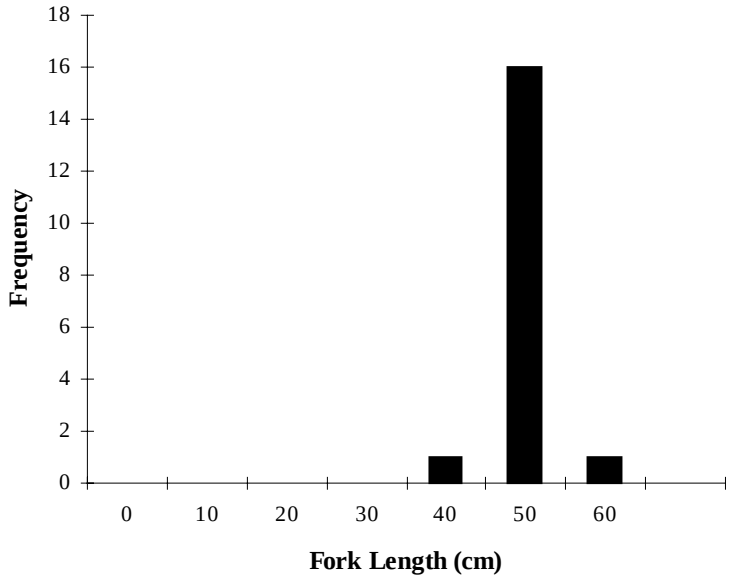


**Figure 12. Length frequency distribution of sucker sampled at the Skookumchuck Creek enumeration fence in 2000.**

## Redd Counts

Bull trout redds did not show up well from the air, however redds were first seen on the September 15th radio tracking flight. Redds were observed in three different locations (river km 27.5-28.5, km 29-30, and km 24-25). The largest concentration of redds were noted in the upper two sections which have served as the index sections over the past four years. Redds were not seen from the air in Sandown Creek or in other sections of Skookumchuck Creek. Overhanging streamside vegetation obscured Bradford Creek and Buhl Creek and consequently no redds were observed in these systems.

A total of 197 bull trout redds were enumerated on the ground on October 4th. The majority of redds (n=189) were observed in the 3.0 km index section (river km 27.5-30.5) that has been surveyed over the past four years. The additional eight redds were observed in a 1.5 km section (river km 24.0-25.5). No redds were observed in the section of Sandown Creek that was surveyed. The increasing trend in the number of bull trout redds present in the study area over the past 3 years continued in 2000 (Figure 13).

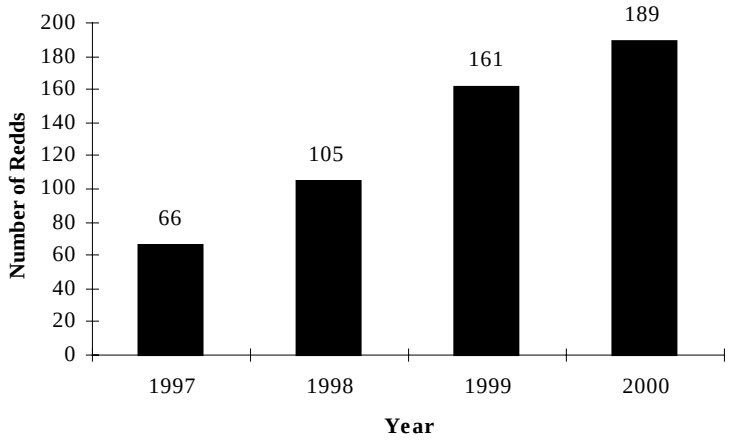


**Figure 13. Total number of bull trout redds counted in the index section of Skookumchuck Creek in 2000 compared to previous counts in other years.**

## Water Temperature Monitoring

We attempted to retrieve all thermographs for downloading on November 23rd. All thermographs except for those in Buhl Creek and the upper Skookumchuck Creek above Buhl Creek were retrieved due to ice buildup in excess of 1.75 m. Summary plots of water temperature for Bradford Creek (Figure 14), Sandown Creek (Figure 15), Skookumchuck Creek at km 39.5 (Figure 16), and Skookumchuck Creek at the fence site (Figure 17) suggested that water temperatures were within the range of those preferred by bull trout (see Baxter and McPhail 1996).

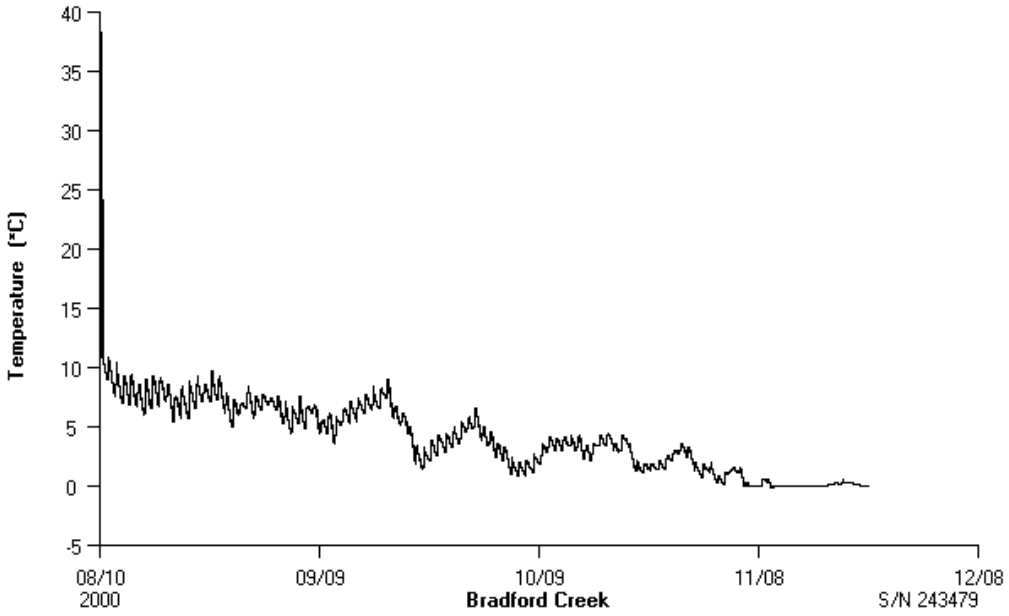


**Figure 14. Water temperature profile for Bradford Creek.**

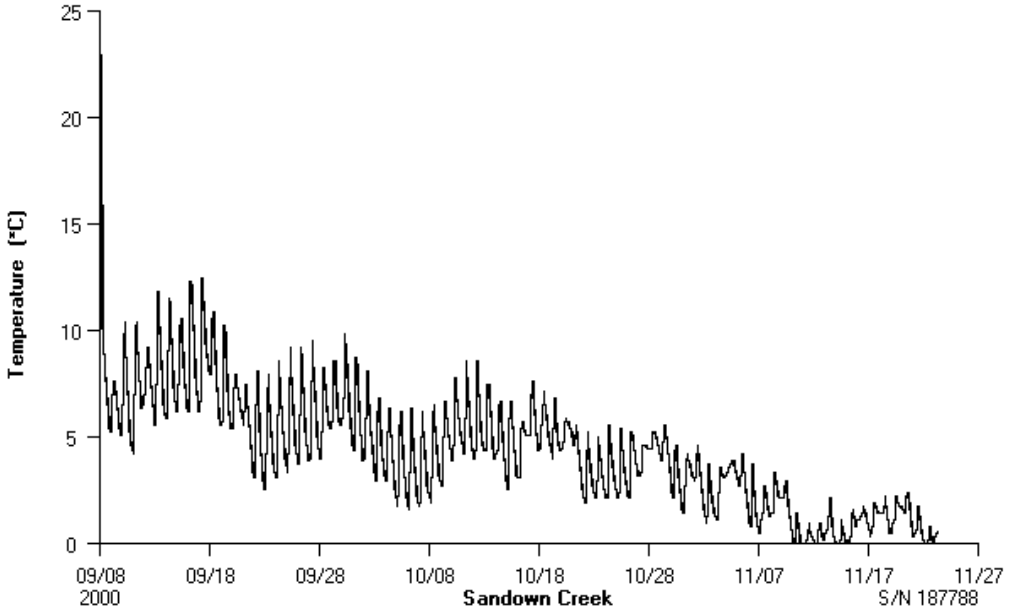


**Figure 15. Water temperature profile for Sandown Creek.**

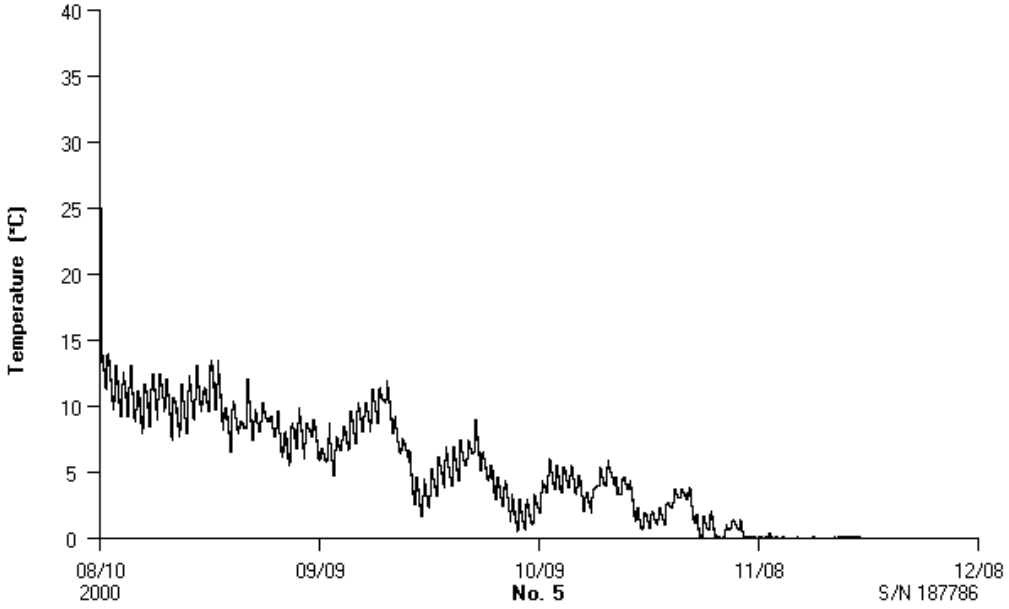


**Figure 16. Water temperature profile for Skookumchuck Creek (km 39.5).**

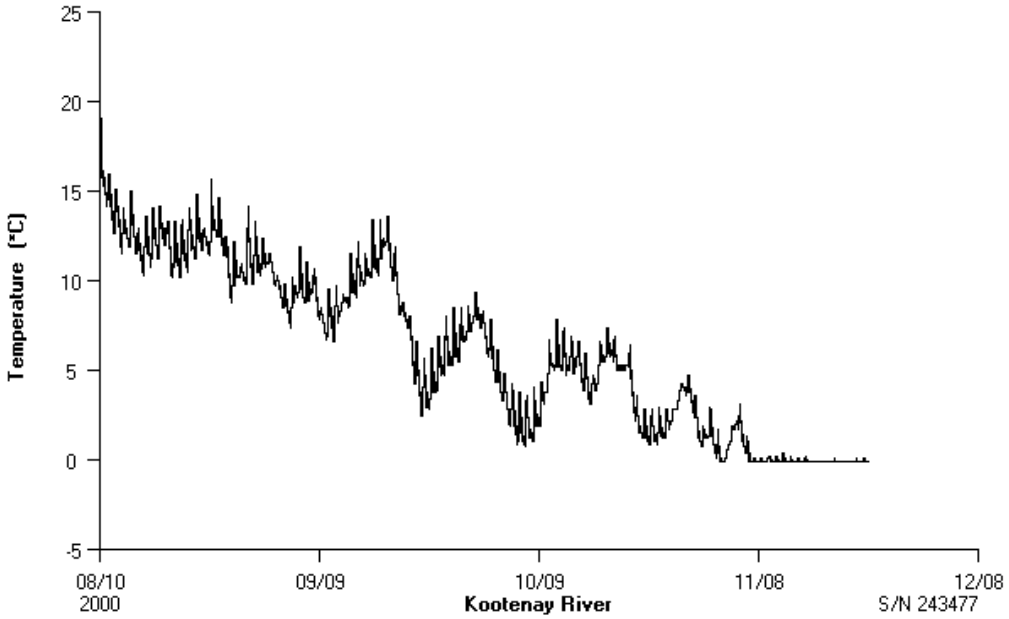


**Figure 17. Water temperature profile for Skookumchuck Creek (fence site).**

## DISCUSSION

Although the enumeration fence was set up to capture downstreaming bull trout kelts, not all bull trout that spawned in the Skookumchuck Creek watershed were sampled through the fence. Thus, the total count of bull trout from this project (n=319) is not a population estimate, but an index of run strength. As with other populations of bull trout in the East Kootenay Region that have been monitored for a number of years (e.g., Wigwam River; see Baxter and Westover 2000) the work on Skookumchuck Creek has shown an increasing trend in bull trout escapement over the past four years. This increase in escapement as documented through redd counts on the index section, corresponds to a number of conservative regulations implemented over the last five years. In 1996/1997 the daily limit for bull trout in the Kootenay Region was reduced to one fish (any size) and beginning in 1999/2000 anglers had to release bull trout in the Kootenay River during the winter months (November 1 to March 31)

From redd counts conducted in the watershed, it is apparent that the index section provides important bull trout spawning habitat. This area was originally identified as a potential index section during a 1996 reconnaissance aerial redd survey of the watershed (W.T. Westover; unpublished data). Since only eight of the 197 redds surveyed in 2000 were found outside this index section it suggests that the area may provide the majority of critical spawning habitat in the watershed. Bull trout are known to key to areas in watersheds where there are suitable habitat characteristics (Baxter and McPhail 1996; McPhail and Baxter 1996), and since groundwater is a known factor that can influence egg survival (Baxter and McPhail 1999), it is highly probable that the index section is an area of groundwater upwelling. As a result of this concentration of redds, it is important that this area be protected from impacts that could negatively effect the Skookumchuck Creek population.

In future years the redd counts should be expanded to further document the importance of this area in the watershed as a whole, as this is an important technique to monitor trends in bull trout abundance (Rieman and Myers 1997). In particular the area from the mouth to the powerlines (5 km upstream) could be surveyed, but upstream of this point it is mostly canyon and likely not suitable spawning habitat until the upper index section. Large spawners have also been sampled in Bradford and Sandown Creek (Baxter and Oliver 1997), and it may be useful to walk these creeks to identify key spawning sites within these two sub-basins.

One interesting note is that one fish that was tagged and released downstream of the Skookumchuck Creek enumeration fence on September 18th (Green Floy tag 0088) was found dead in a small tributary to Lake Koocanusa shortly after it had been passed through the fence. The fish had entered a small tributary, presumably to feed on kokanee as it had a 12 inch kokanee stuck in its throat. The fish was a female and had successfully spawned. It was found on September 28$^{th}$ and had likely been dead a couple of days. Thus, it took this fish less than ten days to migrate down the Kootenay River from the mouth of Skookumchuck Creek to Lake Koocanusa.

It may be necessary to modify the location of the traps at the fence site next year. As the water dropped over the study period, the channel remained deeper on the opposite side of the river to where to traps were located, and bull trout would stack up in this area. As such, relocating the traps to the other side of the river may be advantageous in promoting more fish to migrate downstream.

This project has shown that a combination of redd counts and run strength can provide information needed to effectively manage this population of bull trout. Conservative angling regulations that have been implemented in the past have correlated to the increase in the number of bull trout redds in the Skookumchuck Creek watershed, and it is likely that these regulations are at least in part responsible for the increase. Continuation of this project will help monitor this population that contributes significantly to bull trout abundance in the upper Kootenay River and Lake Koocanusa.

## SUMMARY AND CONCLUSIONS

1. In total 252 bull trout were passed through the enumeration fence, and 67 bull trout were enumerated above the fence before it was removed. The fence provided an acceptable method to provide an index of run strength of Skookumchuck Creek bull trout. There were limited mortalities at the fence, and coupled with redd counts the project provided a good indication of population status.

2. Redd counts confirmed that the majority of spawning sites in the watershed are found in the mainstem of Skookumchuck Creek. Continued redd counts should be carried out on a yearly basis, and the identified areas should be protected from habitat degradation.

3. Redd counts could be expanded to other sections of the watershed where mature bull trout are know to be distributed.

4. All bull trout tagged at the fence received a Floy tag that will provide data on population dynamics. Different colored Floy tags should be used next year to aid with identification of fish recaptures.

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## Appendix I. Length, weight, sex and tag number of bull trout captured at the Skookumchuck Creek fence in 2000.

| Date | Length (cm) | Weight (g) | Sex | Direction | Spag # | Tag Color | Comment |
|---|---|---|---|---|---|---|---|
| 9-Sep | 72 | 3500 | F | ↓ | 0001 | GREEN | PELVIC FIN CLIP |
| 9-Sep | 45 | 700 | ? | ↓ | 0002 | GREEN | UNABLE TO SEX, PELVIC FIN CLIP |
| 9-Sep | 43 | 650 | F | ↓ | 0003 | GREEN | PELVIC FIN CLIP |
| 9-Sep | 73 | 3300 | F | ↓ | 0004 | GREEN | PELVIC FIN CLIP |
| 9-Sep | 76 | 4500 | F | ↓ | 0005 | GREEN | |
| 9-Sep | 54 | 1100 | F | ↓ | 0006 | GREEN | PELVIC FIN CLIP |
| 10-Sep | 67 | 3000 | F | ↓ | 0007 | GREEN | PELVIC FIN CLIP |
| 10-Sep | 59 | 2100 | F | ↓ | 0008 | GREEN | PELVIC FIN CLIP |
| 10-Sep | 72 | 3100 | F | ↓ | 0009 | GREEN | PELVIC FIN CLIP |
| 10-Sep | 83 | 5000 | F | ↓ | 0010 | GREEN | PELVIC FIN CLIP |
| 10-Sep | 78 | 4600 | F | ↓ | 0011 | GREEN | PELVIC FIN CLIP |
| 10-Sep | 62 | 1600 | F | ↓ | 0012 | GREEN | PELVIC FIN CLIP |
| 10-Sep | 75 | 3700 | F | ↓ | 0013 | GREEN | PELVIC FIN CLIP |
| 11-Sep | 77 | 3800 | F | ↓ | 0014 | GREEN | PELVIC FIN CLIP |
| 11-Sep | 63 | 1900 | F | ↓ | 0015 | GREEN | PELVIC FIN CLIP |
| 11-Sep | 62.5 | 2600 | F | ↑ | 0016 | GREEN | PELVIC FIN CLIP |
| 12-Sep | 49.5 | 1100 | F | ↓ | 0017 | GREEN | PELVIC FIN CLIP |
| 12-Sep | 78 | 3900 | F | ↓ | 0018 | GREEN | |
| 12-Sep | 75.5 | 3800 | F | ↓ | 0019 | GREEN | |
| 13-Sep | 54.5 | 1500 | F | ↓ | 0020 | GREEN | PELVIC FIN CLIP |
| 13-Sep | 64 | 2000 | F | ↓ | 0021 | GREEN | |
| 13-Sep | 73 | 3100 | F | ↓ | 0022 | GREEN | |
| 13-Sep | 74.5 | 3700 | F | ↓ | 0023 | GREEN | |
| 13-Sep | 60.5 | 2100 | F | ↓ | 0024 | GREEN | |
| 13-Sep | 56 | 1600 | F | ↓ | 0025 | GREEN | PELVIC FIN CLIP |
| 13-Sep | 78 | 4400 | F | ↓ | 0026 | GREEN | |
| 13-Sep | 84.5 | 5700 | F | ↓ | 0027 | GREEN | |
| 13-Sep | 83 | 5200 | F | ↓ | 0028 | GREEN | |
| 14-Sep | 72.5 | 3500 | F | ↓ | 0029 | GREEN | |
| 14-Sep | 80 | 4600 | F | ↓ | 0030 | GREEN | |
| 14-Sep | 56 | 1500 | F | ↓ | 0032 | GREEN | |
| 14-Sep | 57 | 1700 | F | ↓ | 0033 | GREEN | |
| 14-Sep | 84 | 5300 | F | ↓ | 0034 | GREEN | |
| 14-Sep | 58.5 | 1900 | F | ↓ | 0035 | GREEN | |
| 14-Sep | 75 | 4200 | F | ↓ | 0036 | GREEN | |
| 14-Sep | 70 | 3000 | F | ↓ | 0037 | GREEN | |
| 14-Sep | 69 | 3000 | F | ↓ | 0038 | GREEN | |
| 14-Sep | 81 | 4700 | F | ↓ | 0039 | GREEN | |
| 14-Sep | 75 | 4000 | F | ↓ | 0040 | GREEN | |
| 14-Sep | 59 | 1800 | F | ↓ | 0041 | GREEN | |
| 14-Sep | 68 | 2600 | F | ↓ | 0042 | GREEN | |
| 14-Sep | 74.5 | 3900 | F | ↓ | 0043 | GREEN | |
| 14-Sep | 71 | 3000 | F | ↓ | 0044 | GREEN | |
| 14-Sep | 70 | 3000 | F | ↓ | 0045 | GREEN | |
| 14-Sep | 47 | 900 | F | ↓ | 0046 | GREEN | |
| 15-Sep | 53 | 1500 | F | ↓ | 0047 | GREEN | |

| Date | Length (cm) | Weight (g) | Sex | Direction | Spag # | Tag Color | Comment |
|---|---|---|---|---|---|---|---|
| 15-Sep | 84 | 4900 | F | ↓ | 0048 | GREEN | |
| 15-Sep | 76 | 3900 | F | ↓ | 0049 | GREEN | |
| 15-Sep | 76 | 4400 | F | ↓ | 0050 | GREEN | |
| 15-Sep | 85.5 | 5500 | F | ↓ | 0051 | GREEN | |
| 15-Sep | 82 | 5000 | F | ↓ | 0052 | GREEN | |
| 15-Sep | 77 | 4000 | F | ↓ | 0053 | GREEN | |
| 15-Sep | 57 | 1700 | F | ↓ | 0054 | GREEN | |
| 15-Sep | 47 | 900 | F | ↓ | 0055 | GREEN | |
| 16-Sep | 58 | 1700 | F | ↓ | 0056 | GREEN | |
| 16-Sep | 80 | 5500 | F | ↓ | 0057 | GREEN | |
| 16-Sep | 50 | 1200 | F | ↓ | 0058 | GREEN | |
| 16-Sep | 75 | 4200 | F | ↓ | 0059 | GREEN | |
| 16-Sep | 71 | 3700 | F | ↓ | 0060 | GREEN | |
| 16-Sep | 48.5 | 1000 | F | ↓ | 0061 | GREEN | |
| 16-Sep | 68.5 | 2800 | F | ↓ | 0062 | GREEN | |
| 16-Sep | 47 | 1000 | F | ↓ | 0063 | GREEN | |
| 16-Sep | 70 | 3100 | F | ↓ | 0064 | GREEN | |
| 16-Sep | 75.5 | 4100 | F | ↓ | 0065 | GREEN | |
| 16-Sep | 69 | 3000 | F | ↓ | 0066 | GREEN | |
| 16-Sep | 74.5 | 3900 | F | ↓ | 0067 | GREEN | |
| 16-Sep | 77.5 | 4400 | F | ↓ | 0068 | GREEN | |
| 16-Sep | 61.5 | 1900 | F | ↓ | 0069 | GREEN | |
| 17-Sep | 73 | 3900 | F | ↓ | 0070 | GREEN | |
| 17-Sep | 82 | 4600 | F | ↓ | 0071 | GREEN | |
| 17-Sep | 61.5 | 2200 | F | ↓ | 0072 | GREEN | |
| 17-Sep | 70 | 3300 | F | ↓ | 0073 | GREEN | |
| 17-Sep | 80.5 | 4800 | F | ↓ | 0074 | GREEN | |
| 17-Sep | 89 | 6500 | M | ↓ | 0075 | GREEN | PELVIC FIN CLIP |
| 17-Sep | 76 | 4500 | F | ↓ | 0076 | GREEN | |
| 17-Sep | 75.5 | 4000 | M | ↓ | 0078 | GREEN | |
| 17-Sep | 71 | 3700 | F | ↓ | 0080 | GREEN | |
| 18-Sep | 64 | 2300 | F | ↓ | 0081 | GREEN | |
| 18-Sep | 57 | 1700 | F | ↓ | 0082 | GREEN | |
| 18-Sep | 76 | 3800 | F | ↓ | 0083 | GREEN | |
| 18-Sep | 48.5 | 1100 | F | ↓ | 0084 | GREEN | |
| 18-Sep | 88 | 5700 | M | ↓ | 0085 | GREEN | PELVIC FIN CLIP |
| 18-Sep | 70 | 2700 | F | ↓ | 0086 | GREEN | |
| 18-Sep | 61.5 | 1900 | F | ↓ | 0087 | GREEN | |
| 18-Sep | 71 | 3200 | F | ↓ | 0088 | GREEN | |
| 18-Sep | 68 | 3000 | F | ↓ | 0089 | GREEN | |
| 18-Sep | 74.5 | 4100 | F | ↓ | 0090 | GREEN | |
| 18-Sep | 58.5 | 1800 | F | ↓ | 0091 | GREEN | |
| 18-Sep | 67.5 | 2900 | F | ↓ | 0092 | GREEN | |
| 18-Sep | 60.5 | 1800 | F | ↓ | 00227 | YELLOW | RADIO TAGGED |
| 18-Sep | 49 | 1300 | F | ↓ | 0093 | GREEN | |
| 18-Sep | 72.5 | 4500 | M | ↑ | 0094 | GREEN | PELVIC FIN CLIP |
| 18-Sep | 65 | 3000 | F | ↓ | 0095 | GREEN | |
| 19-Sep | 81 | 5100 | M | ↓ | 0096 | GREEN | PELVIC FIN CLIP |
| 19-Sep | 70.5 | 3100 | F | ↓ | 0097 | GREEN | |

| Date | Length (cm) | Weight (g) | Sex | Direction | Spag # | Tag Color | Comment |
|---|---|---|---|---|---|---|---|
| 19-Sep | 63.5 | 2200 | F | ↓ | 0098 | GREEN | |
| 19-Sep | 75 | 3500 | F | ↓ | 0099 | GREEN | |
| 19-Sep | 76 | 3900 | F | ↓ | 0100 | GREEN | |
| 19-Sep | 40 | 700 | F | ↓ | 0101 | GREEN | |
| 19-Sep | 54.5 | 1500 | F | ↓ | 0102 | GREEN | |
| 19-Sep | 91.5 | 8800 | M | ↓ | 0103 | GREEN | PELVIC FIN CLIP |
| 19-Sep | 80 | 5700 | F | ↓ | 0104 | GREEN | POSSIBLE SPINAL DEFORMITY |
| 19-Sep | 55 | 1800 | F | ↓ | 0105 | GREEN | |
| 19-Sep | 58 | 1500 | F | ↓ | 0106 | GREEN | |
| 19-Sep | 61 | 2000 | F | ↓ | 0107 | GREEN | |
| 19-Sep | 78 | 3900 | F | ↓ | 0108 | GREEN | |
| 19-Sep | 62 | 2200 | F | ↓ | 0109 | GREEN | |
| 19-Sep | 62 | 2200 | F | ↓ | 0110 | GREEN | |
| 19-Sep | 72.5 | 3400 | F | ↓ | 0111 | GREEN | |
| 19-Sep | 70.5 | 3300 | F | ↓ | 0112 | GREEN | |
| 19-Sep | 66.5 | 2700 | M | ↓ | 0113 | GREEN | PELVIC FIN CLIP |
| 19-Sep | 55 | 1500 | F | ↓ | 0114 | GREEN | |
| 19-Sep | 76.5 | 4200 | F | ↓ | 0115 | GREEN | |
| 20-Sep | 65.5 | 2600 | F | ↓ | 00236 | YELLOW | RADIO TAGGED |
| 20-Sep | 75 | 3900 | F | ↓ | 00237 | YELLOW | RADIO TAGGED |
| 20-Sep | 80 | 4200 | F | ↓ | 00238 | YELLOW | RADIO TAGGED |
| 20-Sep | 54 | 1300 | M | ↓ | 0116 | GREEN | |
| 20-Sep | 78 | 4300 | F | ↓ | 0117 | GREEN | |
| 20-Sep | 82 | 5100 | F | ↓ | 0118 | GREEN | |
| 20-Sep | 83 | 5000 | F | ↓ | 0119 | GREEN | |
| 20-Sep | 63 | 2400 | F | ↓ | 0120 | GREEN | |
| 20-Sep | 68 | 3200 | F | ↓ | 0121 | GREEN | |
| 20-Sep | 74 | 3500 | M | ↓ | 0122 | GREEN | PELVIC FIN CLIP |
| 20-Sep | 48.5 | 1000 | F | ↓ | 0124 | GREEN | |
| 20-Sep | 58.5 | 1600 | F | ↓ | 0125 | GREEN | |
| 20-Sep | 57.5 | 1600 | F | ↓ | 0126 | GREEN | |
| 20-Sep | 68.5 | 2600 | F | ↓ | 0127 | GREEN | |
| 20-Sep | 76.5 | 4000 | M | ↓ | 0128 | GREEN | PELVIC FIN CLIP |
| 20-Sep | 72 | 3400 | F | ↓ | 0129 | GREEN | |
| 20-Sep | 64 | 2200 | M | ↓ | 0130 | GREEN | PELVIC FIN CLIP |
| 20-Sep | 68 | 2700 | F | ↓ | 0132 | GREEN | |
| 20-Sep | 74 | 3500 | F | ↓ | 0133 | GREEN | |
| 20-Sep | 66 | 2600 | F | ↓ | 0134 | GREEN | |
| 20-Sep | 55.5 | 1600 | F | ↓ | 0135 | GREEN | |
| 20-Sep | 62 | 2100 | F | ↓ | 0136 | GREEN | |
| 21-Sep | 76 | 3800 | M | ↓ | 0137 | GREEN | PELVIC FIN CLIP |
| 21-Sep | 73.5 | 3500 | M | ↓ | 0138 | GREEN | PELVIC FIN CLIP |
| 21-Sep | 80 | 4400 | M | ↓ | 0139 | GREEN | PELVIC FIN CLIP |
| 21-Sep | 82.5 | 4600 | F | ↓ | 0140 | GREEN | |
| 21-Sep | 77.5 | 4000 | F | ↓ | 0141 | GREEN | |
| 21-Sep | 72 | 3400 | F | ↓ | 0142 | GREEN | |
| 21-Sep | 85 | 6100 | F | ↓ | 0143 | GREEN | |
| 21-Sep | 75 | 3900 | F | ↓ | 0144 | GREEN | |
| 21-Sep | 73 | 3600 | F | ↓ | 0145 | GREEN | |

| Date | Length (cm) | Weight (g) | Sex | Direction | Spag # | Tag Color | Comment |
|---|---|---|---|---|---|---|---|
| 21-Sep | 84 | 6200 | M | ↓ | 0146 | GREEN | PELVIC FIN CLIP |
| 21-Sep | 90 | 7000 | M | ↓ | 0147 | GREEN | PELVIC FIN CLIP |
| 21-Sep | 73 | 3300 | F | ↓ | 0148 | GREEN | |
| 21-Sep | 60.5 | 1900 | F | ↓ | 0149 | GREEN | |
| 21-Sep | 69.5 | 2900 | F | ↓ | 0150 | GREEN | |
| 21-Sep | 81 | 4900 | M | ↓ | 0151 | GREEN | PELVIC FIN CLIP |
| 21-Sep | 56 | 1400 | F | ↓ | 0152 | GREEN | |
| 21-Sep | 53.5 | 1300 | F | ↓ | 0153 | GREEN | |
| 21-Sep | 65 | 2400 | M | ↓ | 0154 | GREEN | PELVIC FIN CLIP |
| 22-Sep | 65 | 2100 | F | ↓ | 0155 | GREEN | |
| 22-Sep | 57 | 1600 | F | ↓ | 0156 | GREEN | |
| 22-Sep | 82 | 4900 | F | ↓ | 0157 | GREEN | |
| 22-Sep | 50 | 1000 | F | ↓ | 0158 | GREEN | |
| 22-Sep | 87 | 6700 | M | ↓ | 0159 | GREEN | PELVIC FIN CLIP |
| 22-Sep | 67.5 | 2700 | F | ↓ | 0160 | GREEN | |
| 22-Sep | 69 | 2800 | F | ↓ | 0161 | GREEN | |
| 22-Sep | 48 | 1000 | F | ↓ | N/A | N/A | FOUND DEAD ON FENCE, KELT |
| 22-Sep | 73 | 3200 | F | ↓ | 0162 | GREEN | |
| 22-Sep | 65 | 2500 | F | ↓ | 0163 | GREEN | |
| 22-Sep | 80 | 4400 | F | ↓ | 0164 | GREEN | |
| 22-Sep | 80 | 5100 | F | ↓ | 0165 | GREEN | |
| 22-Sep | 91.5 | 7400 | M | ↓ | 0166 | GREEN | PELVIC FIN CLIP |
| 22-Sep | 74.5 | 3500 | F | ↓ | 0167 | GREEN | |
| 22-Sep | 71 | 2900 | F | ↓ | 0168 | GREEN | |
| 22-Sep | 78 | 4500 | M | ↓ | 0169 | GREEN | PELVIC FIN CLIP |
| 22-Sep | 82 | 4600 | F | ↓ | 0170 | GREEN | |
| 22-Sep | 64 | 2600 | F | ↓ | 0171 | GREEN | |
| 22-Sep | 60.5 | 1700 | F | ↓ | 0172 | GREEN | |
| 23-Sep | 87.5 | 5900 | M | ↓ | 0173 | GREEN | PELVIC FIN CLIP |
| 23-Sep | 58.5 | 1500 | F | ↓ | 0174 | GREEN | |
| 23-Sep | 81 | 4900 | M | ↓ | 0175 | GREEN | PELVIC FIN CLIP |
| 23-Sep | 64.5 | 2200 | F | ↓ | 0176 | GREEN | |
| 23-Sep | 71.5 | 3800 | F | ↓ | 0177 | GREEN | |
| 23-Sep | 52.5 | 1400 | F | ↓ | 0178 | GREEN | |
| 23-Sep | 71 | 3000 | F | ↓ | 00226 | YELLOW | RADIO TAGGED, SUTURES PRESENT |
| 23-Sep | 49.5 | 1100 | F | ↓ | 0179 | GREEN | |
| 23-Sep | 68.5 | 2700 | M | ↓ | 0180 | GREEN | PELVIC FIN CLIP |
| 23-Sep | 60 | 2000 | F | ↓ | 0181 | GREEN | |
| 23-Sep | 85 | 5200 | M | ↓ | 0182 | GREEN | PELVIC FIN CLIP |
| 23-Sep | 59.5 | 1600 | F | ↓ | 0183 | GREEN | |
| 24-Sep | 92 | 7700 | M | ↓ | 0184 | GREEN | |
| 24-Sep | 60.5 | 1800 | F | ↓ | 0185 | GREEN | |
| 24-Sep | 60 | 2400 | F | ↓ | 0186 | GREEN | |
| 24-Sep | 81 | 4700 | M | ↓ | 0187 | GREEN | |
| 24-Sep | 80 | 4200 | M | ↓ | 0188 | GREEN | |
| 24-Sep | 88 | 6500 | M | ↓ | 00225 | YELLOW | RADIO TAGGED, SUTURES PRESENT |
| 24-Sep | 71 | 3300 | F | ↓ | 0189 | GREEN | |
| 24-Sep | 47 | 800 | F | ↓ | 0190 | GREEN | |
| 24-Sep | 51 | 1000 | M | ↓ | 0191 | GREEN | |

| Date | Length (cm) | Weight (g) | Sex | Direction | Spag # | Tag Color | Comment |
|---|---|---|---|---|---|---|---|
| 24-Sep | 57 | 1600 | F | ↓ | 0192 | GREEN | |
| 25-Sep | 82 | 4900 | M | ↓ | 0193 | GREEN | |
| 25-Sep | 47 | 900 | F | ↓ | 0194 | GREEN | |
| 25-Sep | 79.5 | 4700 | M | ↓ | 0195 | GREEN | |
| 25-Sep | 45.5 | 900 | F | ↓ | 0196 | GREEN | |
| 25-Sep | 82.5 | 5200 | M | ↓ | 0197 | GREEN | |
| 25-Sep | 70 | 2800 | F | ↓ | 0198 | GREEN | |
| 25-Sep | 51.5 | 1100 | F | ↓ | 0199 | GREEN | |
| 25-Sep | 83.5 | 5300 | M | ↓ | 0200 | GREEN | |
| 25-Sep | 60 | 2100 | M | ↓ | 0201 | GREEN | |
| 26-Sep | 92 | 8500 | M | ↓ | 0202 | GREEN | |
| 26-Sep | 61 | 1800 | F | ↓ | 0203 | GREEN | |
| 26-Sep | 57.5 | 1600 | M | ↓ | 0204 | GREEN | |
| 26-Sep | 58 | 1800 | M | ↓ | 0205 | GREEN | |
| 27-Sep | 82 | 5100 | M | ↓ | 0206 | GREEN | |
| 27-Sep | 91 | 7900 | M | ↓ | 0207 | GREEN | |
| 27-Sep | 63 | 2400 | M | ↓ | 0208 | GREEN | |
| 27-Sep | 61 | 1700 | F | ↓ | 0209 | GREEN | |
| 28-Sep | 90 | 7700 | M | ↓ | 0210 | GREEN | |
| 28-Sep | 84 | 5500 | M | ↓ | N/A | N/A | FOUND DEAD ON FENCE |
| 28-Sep | 67 | 2700 | F | ↓ | 0211 | GREEN | |
| 28-Sep | 77 | 4100 | M | ↓ | 0212 | GREEN | |
| 28-Sep | 77 | 4100 | M | ↓ | 0213 | GREEN | |
| 28-Sep | 50 | 1200 | F | ↓ | 0214 | GREEN | |
| 29-Sep | 81.5 | 4500 | M | ↓ | 0215 | GREEN | |
| 29-Sep | 88.5 | 6100 | M | ↓ | 0216 | GREEN | |
| 29-Sep | 57 | 1700 | M | ↓ | 0217 | GREEN | |
| 29-Sep | 52 | 1200 | F | ↓ | 0218 | GREEN | |
| 29-Sep | 80 | 4500 | M | ↓ | 0219 | GREEN | |
| 29-Sep | 50 | 1000 | F | ↓ | 0220 | GREEN | |
| 30-Sep | 86 | 5600 | F | ↓ | 0221 | GREEN | |
| 30-Sep | 89 | 6000 | M | ↓ | 0222 | GREEN | |
| 30-Sep | 82 | 4900 | M | ↓ | 0223 | GREEN | |
| 30-Sep | 52 | 1000 | F | ↓ | 0224 | GREEN | |
| 30-Sep | 58 | 1400 | F | ↓ | 0225 | GREEN | |
| 30-Sep | 64 | 2000 | F | ↓ | 0226 | GREEN | |
| 30-Sep | 80 | 4600 | F | ↓ | 0227 | GREEN | |
| 30-Sep | 81 | 4700 | M | ↓ | 0228 | GREEN | |
| 30-Sep | 48 | 1000 | F | ↓ | 0229 | GREEN | |
| 30-Sep | 58 | 1600 | F | ↓ | 0230 | GREEN | |
| 30-Sep | 64 | 2100 | F | ↓ | 0231 | GREEN | |
| 30-Sep | 62 | 2100 | F | ↓ | 0232 | GREEN | |
| 1-Oct | 87 | 6800 | M | ↓ | 0233 | GREEN | |
| 2-Oct | 70 | 3100 | M | ↓ | 0234 | GREEN | |
| 3-Oct | 86 | 6600 | M | ↓ | 0235 | GREEN | |
| 4-Oct | 87 | 6400 | M | ↓ | 0236 | GREEN | |
| 4-Oct | 43.5 | 700 | F | ↓ | 0237 | GREEN | FENCE BLOWN OUT FOR 4-6 HRS |
| 5-Oct | 92 | 8200 | M | ↓ | 0239 | GREEN | |
| 7-Oct | 78 | 4100 | F | ↓ | 0240 | GREEN | |

| Date | Length (cm) | Weight (g) | Sex | Direction | Spag # | Tag Color | Comment |
|---|---|---|---|---|---|---|---|
| 7-Oct | 66 | 2600 | M | ↓ | 00206 | YELLOW | RADIO TAGGED, COMPLETELY HEALED |
| 9-Oct | 91 | 8200 | M | ↓ | 0241 | GREEN | |
| 9-Oct | 75 | 4400 | M | ↓ | 0242 | GREEN | |
| 9-Oct | 84 | 5000 | F | ↓ | 0243 | GREEN | |
| 9-Oct | 85.5 | 5500 | M | ↓ | 0244 | GREEN | |
| 9-Oct | 77 | 3900 | M | ↓ | 0245 | GREEN | |
| 11-Oct | 85.5 | 7400 | M | ↓ | 0246 | GREEN | |
| 11-Oct | 61 | 2300 | F | ↑ | 0247 | GREEN | |
| 11-Oct | 55 | 1200 | F | ↓ | 0248 | GREEN | |
| 14-Oct | 47.5 | 700 | F | ↓ | 0249 | GREEN | |